

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-258241

(43)Date of publication of application : 11.09.2002

(51)Int.Cl.

G02F 1/13  
G02F 1/1333  
G03B 21/00  
G03B 21/14

(21)Application number : 2001-385785

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(22)Date of filing : 27.10.1994

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(30)Priority

Priority number : 05269061

Priority date : 27.10.1993

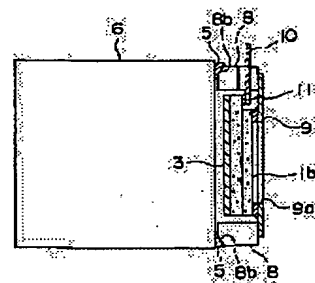
Priority country : JP

## (54) LIQUID CRYSTAL PROJECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To simplify the structure of a liquid crystal projector to reduce number of parts and then achieve man-hour reduction in assembling and controlling works.

SOLUTION: The liquid crystal projector is provided with plural liquid crystal panels 1a, 1b and 1c, a photosynthetic prism 6 photosynthesizing the lights modulated by the above liquid crystal panels 1a, 1b and 1c, a projector lens 7 projecting the lights photosynthesized by the photosynthetic prism 6, a holding member 9 holding the liquid crystal panels 1a, 1b and 1c, a mounting member 4 securing the holding member 9, and a spacer 5 lying between the mounting member 4 and the entrance face side of the photosynthetic prism 6. The holding member 9 and the mounting member 4 are detachably-secured with screws, while the mounting member 4 and the entrance face side of the photosynthetic prism 6 are firmly bonded through the spacer 5.



## LEGAL STATUS

[Date of request for examination]

19.12.2001

[Date of sending the examiner's decision of rejection]

09.11.2004

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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**CLAIMS**

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[Claim(s)]

[Claim 1] A photosynthesis means to compound the light modulated with two or more liquid crystal panels and said two or more liquid crystal panels, The projection lens which projects the light compounded by said photosynthesis means, and the attachment component holding said liquid crystal panel, The attachment member which is fixing said attachment component, and the spacing member which intervenes between said attachment member and the plane-of-incidence side of said photosynthesis means, It is the liquid crystal projector which it is the liquid crystal projector which \*\*\*\*, and said attachment component and said attachment member demount according to \*\*\*\*, is being fixed in the possible condition, and is characterized by carrying out adhesion immobilization of the plane-of-incidence side of said attachment member and said photosynthesis means through a spacing member.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to liquid crystal projectors which used the liquid crystal panel, such as a front mold and a rear mold, especially the adjustment device of the liquid crystal panel.

[0002]

[Description of the Prior Art] Conventionally, what fixes a liquid crystal panel to photosynthesis prism directly is indicated by for example, JP,63-10128,A and a Japanese-Patent-Application-No. No. 270557 [ four to ] official report as attaching structure of a liquid crystal panel. In these official reports Especially red and the light separated green and blue By simplification of the device which carries out arrangement adjustment (henceforth focal adjustment) of each liquid crystal stratification plane used as a photographic subject into mutual pixel doubling adjustment (henceforth alignment adjustment) of two or more liquid crystal panels (it is also called a light valve) to modulate, and the focal permission depth of a projector lens It is shown that small and lightweight-izing of image formation optical system, components reduction, cost reduction by mitigation of a rigging activity, etc. are planned.

[0003]

[Problem(s) to be Solved by the Invention] However, when the liquid crystal panel was being firmly fixed to photosynthesis prism and repair and playback arose, the removal of what is proposed in these official reports was very troublesome. Although there was little repair produced after shipping to a commercial scene from works, at the works before shipment, the need for repair and playback often occurred according to the following cause.

[0004] 1) Exchange and playback with excellent articles by \*\*, such as adhering dirt, such as destruction and \*\*\*\* of the circuit element by static electricity which enters from the pattern open circuit by the chip, and an electrode terminal by the handling between the processes of a liquid crystal panel, and adhesives.

2) Although it sets at the time of the mass-production early stages of a liquid crystal panel, and each production process is not stabilized but a claim occurs suddenly, they are exchange and playback with the excellent article in such a case.

[0005] Moreover, alignment adjustment precision becomes indispensable [ holding down to 1/2 pixel or less between pixels ] to mitigation of a feeling of dotage and color gap prevention of a screen. If a part for the precision gap of the synthetic field of the part for the chromatic aberration of magnification and the photosynthesis prism of a projector lens is taken into consideration, it is necessary to raise adjustment precision into several microns. Furthermore, although a focal adjustment precision changes with setup with the value of permission \*\*\*\*\* of a projection image, and an F value, the permission depth of focus becomes about 100-micrometer order, and the adjustment to within the limits of this is needed. For this reason, the large sum adjustment machine which can adjust 6 shaft orientations of dedication is needed. Furthermore, \*\* ON will be carried out to the base or plant which is actually impossible as for arranging this large sum adjustment machine at all the bases that perform after-sale service, and was restricted, and repair and playback of must be done. For this reason, the following troubles are pointed out.

[0006] 1) If trouble is caused to quick after-sale service or unit exchange of image formation optical system is performed, a very large sum costs burden will be forced upon a visitor.

2) Also when carrying out repair and playback into a plant, lower the availability of mass production, and lead to a cost rise.

[0007] Furthermore, a liquid crystal panel and photosynthesis prism are expensive components, if three liquid crystal panels are used for red, blue, and green and high definition things, such as 640x480-dot array correspondence, are moreover used, since it has accounted for 40 percent from about twenty percent of parts cost, it becomes great futility to carry out the cast away as a defective, and it becomes an increase of cost.

[0008] The purpose of this invention simplifies structure, reduces the number of components, and is to offer the liquid crystal projector which reduced the man day of assembly and tuning. Other purposes of this invention are to offer the liquid crystal projector which made easy exchange of the liquid crystal panel after manufacture. Other purposes of this invention are to offer the liquid crystal projector from which assembly and tuning are made easy and the high-definition image was acquired. The purpose of further others of this invention is to realize small optical system and offer the liquid crystal projector excellent in small and lightweight-ization.

[0009]

[Means for Solving the Problem] A photosynthesis means by which the liquid crystal projector concerning this invention compounds the light modulated with two or more liquid crystal panels and two or more liquid crystal panels, The projection lens which projects the light compounded by the photosynthesis means, and the attachment component holding a liquid crystal panel, It is the liquid crystal projector which has the attachment member which is fixing the attachment component, and the spacing member which intervenes between an attachment member and the plane-of-incidence side of a photosynthesis means. An attachment component and an attachment member demount according to

\*\*\*\*, it is fixed in the possible condition, and adhesion immobilization of an attachment member and the plane-of-incidence side of a photosynthesis means is carried out through the spacing member.

[0010] Since this invention is constituted as mentioned above, it has the following advantages.

1) Since the device for focal alignment-adjusting and adjusting is omitted, optical system becomes small and lightweight and only the part can realize a small liquid crystal projector. When the liquid crystal panel is miniaturized taking advantage of the advantage of poly-Si TFT, if it is also going to miniaturize optical system in connection with it, the aforementioned adjustment device will become the first factor which checks a miniaturization, but since the adjustment device is omissible according to this invention, the miniaturization of equipment is realizable.

2) Moreover, the passage tooth space of the cooling style can be made to increase by using the tooth space of the part which omitted the aforementioned adjustment device. Furthermore, in order that an attachment member, a frame, etc. may form positive passage, with improvement in cooling effectiveness, also in a small fan, cooling becomes possible and it becomes advantageous to a miniaturization also from these points.

3) Mutual location gap of a liquid crystal panel can be prevented by fixing a liquid crystal panel to a photosynthesis means, for example, photosynthesis prism. Therefore, the improvement in dependability of disturbance-proof nature, temperature-proof variability, handling-proof nature, etc. is attained. In addition, even when [ which is depended on the member from which a coefficient of thermal expansion differs ] combining and carrying out adhesion immobilization, it depends and shifts to a temperature change-proof to operating temperature limits by setup of optimal adhesives and adhesion conditions, and a glass transition point, and a crack etc. can be prevented. Therefore, a pixel gap can be suppressed and correspondence to higher definition goods is enabled.

[0011] 4) reduction of the components expense and assembly expense accompanying the abbreviation of an adjustment device — in addition, since downsizing of an expensive optic is attained, it can contribute to cost reduction greatly.

5) Since the amount of back focuses of a projector lens is made especially small, the impossible lens design which is not can be performed, and when an F value is made greatly and moreover also increases the amount of incident light, raise a cost performance much more.

6) Moreover, even if a defect occurs in a liquid crystal panel in the manufacture middle inside works, or a commercial scene, make it possible to exchange for the liquid crystal panel of an excellent article, and to reproduce, without using the alignment adjustment machine of dedication also in a commercial scene and works. Therefore, large sum after-sale service expense can be mitigated, and moreover it can fix for a short period of time, and the improvement in availability and percent-defective reduction in mass production of the alignment adjustment machine of dedication in works can be aimed at.

[0012] 7) Furthermore, it has the advantage which can exclude focal adjustment. By the design of the projector lens which made the incident light of a tele cent rucksack the subject, when the screen size of a liquid crystal panel does not change, if it uses together that dotage is comparatively large and a gap of a focus can approve practically, it will become more effective.

8) in addition, chip, crack, and electrostatic-discharge — produced on handling since the liquid crystal panel is protected by the shielding case and the attachment component — soiling — etc. — since it can prevent, improvement in the yield and an after-sale service disposition top can be planned.

9) Moreover, since the optical unit which made one a projector lens, photosynthesis prism, a liquid crystal panel, etc. can be formed in a housing, handling nature and assembly nature improve. Moreover, while low-pass [ of an adjustment man day ] is planned using the master lens for adjustment as unnecessary, the bad influence by gap of the property of a projector lens can be prevented.

Furthermore, it has the application permuted also by the cross dichroic mirror method.

10) Furthermore, it also becomes possible to transpose a housing to the box of optical system and to unify.

[0013]

[Embodiment of the Invention] Drawing 1 is the top view showing the configuration of the optical unit of the liquid crystal projector concerning 1 operation gestalt of this invention. In drawing, liquid crystal panels 1a, 1b, and 1c modulate optical 2a from which the light of the light source (not shown) was separated into red, green, and a blue light according to separation optical system (not shown), 2b, and 2c based on the video signal of a control circuit (not shown). The polarizing plate 3 is arranged at the outgoing radiation side of liquid crystal panels 1a, 1b, and 1c, respectively, this is stuck on the panel glass of liquid crystal panels 1a, 1b, and 1c, respectively, and \*\*\*\*\* immobilization is carried out. The attachment member 4 is constituted by the prism configuration which consists of glass material and ceramic material – or resin material, adhesion immobilization of one side face of the prism configuration is carried out at the both-sides section of liquid crystal panels 1a, 1b, and 1c, respectively, and ramp 4a is formed in the side face of another side. The spacing member (plurality) 5 consists of wedge-shaped glass material, and is arranged under ramp 4a. The image light which the die clo IKKU layer is contained in the photosynthesis prism 6, the optical plane of incidence counters with liquid crystal panels 1a, 1b, and 1c, is arranged, and was carried out by having become irregular with liquid crystal panels 1a, 1b, and 1c is compounded by the die clo IKKU layer, and it projects on a screen (illustration abbreviation) with a projector lens 7.

[0014] In addition, although one side face of the attachment member 4 carries out adhesion immobilization in the panel glass side of liquid crystal panels 1a, 1b, and 1c, adhesion immobilization is carried out like illustration on the outside of a polarizing plate 3 so that the attachment member 4 may cover the polarizing plate 3 by the side of outgoing radiation then or it may not contact. Moreover, a spacing member 5 is inserted in the clearance between the cross-section triangles formed by ramp 4a of the attachment member 4, and the optical plane of incidence of the photosynthesis prism 6, and mutual is fixed by the glue line formed in the minimum clearance.

[0015] Next, the activity approach of assembly and alignment adjustment is explained. The attachment member 4 is fixed to each of liquid crystal panels 1a, 1b, and 1c with the adhesives of a photo-curing mold which hardens by the light and is softened with heating, and a liquid crystal panel unit is formed in it. And a liquid crystal panel unit is made CHATCHINGU [ an alignment adjustment machine ], and it brings to the optical plane-of-incidence location of the photosynthesis prism 6. it adjusts by carrying out location appearance, respectively so that a liquid crystal side may enter in justification of the X and the direction of a Y-axis which \*\*\*\* to the optical axis of a projector lens 7, justification of the hand of cut of X-theta-Y-theta consisting mainly of X and a Y-axis, and the focal plane of a projector lens 7.

[0016] Next, insert the spacing member (plurality) 5 which applied the adhesives of a photoresist, irradiate light, such as ultraviolet rays, the clearance between the cross-section triangles formed by the optical plane of incidence of the photosynthesis prism 6 and ramp 4a of the attachment member 4 is made to harden adhesives, and it fixes to it.

[0017] Next, focusing is performed like [ liquid crystal panels / 1a and 1c ] the above, and an alignment adjustment machine performs rotation adjustment within the field further formed with X, Y shaft orientations, and XY shaft so that a mutual pixel may be in agreement on the basis of liquid crystal panel 1b. After being able to carry out location \*\*\*\*\*, the wedge 5 which applied the adhesives of a photoresist like the above-mentioned is inserted in the clearance between the cross-section triangles formed by ramp 4a of the attachment member 4, and the optical plane of incidence of the photosynthesis prism 6, light, such as ultraviolet rays, is irradiated, hardening adhesion is carried out and a prism unit is formed.

[0018] Drawing 2 is the block diagram showing the configuration of the control device for performing the activity and alignment tuning of the above-mentioned assembly. In drawing, CRT101 and storage 102 are connected to the personal computer 100, and a personal computer 100 drives the drive circuit 104 through a control unit 103. The drive circuit 104 controls 6 shaft MANYUPURETA 105, and performs focal adjustment about the liquid crystal panels 1b, 1a, and 1c of above-mentioned drawing 1 , and alignment adjustment, respectively. And after the adjustment is completed, the drive circuit 104 drives

ultraviolet-rays equipment 107, irradiates light, such as ultraviolet rays, stiffens adhesives, and fixes the attachment member 4 to the photosynthesis prism 6. In this adjustment, what projected the image from the projection lens 7 of the optical unit 106 on direct or a screen is picturized with CCD camera 108, and that image pick-up signal is displayed on CRT110 through the image circuit 109.

[0019] Drawing 3 (A) and (B) are the explanatory views of the image displayed on CRT110 at the time of this alignment. It is made for drawing 3 (A) to display the pattern 112 of each pixel of liquid crystal panels 1a, 1b, and 1c as it is. And it is made for drawing 3 (B) to display a test pattern 113 on liquid crystal panels 1a, 1b, and 1c. A personal computer 100 is operated looking at the display pattern, and above-mentioned adjustment is performed, controlling 6 shaft MANYUPURETA 105.

[0020] Next, other examples of a configuration of the attachment member 4 of drawing 1 are explained. Drawing 4 (A) - (C) is the explanatory view having shown other examples of a configuration of the attachment member 4 of drawing 1, respectively. In the example of drawing 4 (A), the spacing member 5 is arranged between liquid crystal panel 1b and the attachment member 4. Many of the clearance between cross-section triangles in which it is formed between ramp 4a and liquid crystal panel 1b which were formed in other side faces of the attachment member 4 are not fixed. Therefore, if 2- trichotomy of is done in the vertical direction, the configuration of each insertion part will be suited, and it will be easy to secure adhesion area, and the amount of lugs to the exterior can be stopped, and it will become interference prevention with a contiguity member.

[0021] In the example of drawing 4 (B), the attachment member 4 is made to really form in the photosynthesis prism 6, and rationalization of assembly operation is enabled. Moreover, the attachment member 4 made to adjoin each other in the example of drawing 4 (C) is unified, and adhesion fixing of this attachment member 4 is carried out like the illustration to the corner of the photosynthesis prism 6.

[0022] By the way, if a liquid crystal panel should become a defect or a defective should mix after manufacturing the optical unit 106, a dryer, laser light, etc. are applied and a part for jointing of liquid crystal panels 1a, 1b, and 1c and the attachment member 4 is heated. And with heating, adhesives can become soft and liquid crystal panels 1a, 1b, and 1c can be exfoliated by few force. Since the attachment member 4 is fixed to the photosynthesis prism 6 at this time, adhesion immobilization is carried out and the liquid crystal panel unit of an excellent article can be reexchanged for one side face of the attachment member 4. Furthermore, in this case, since the mutual physical relationship of the direction of a focus does not have modification, focal tuning can be excluded.

[0023] Drawing 5 is the top view showing the configuration of a part of optical unit of the liquid crystal projector concerning other operation gestalten of this invention, and drawing 6 is the expanded front view. The part which is different from the operation gestalt of drawing 1 is then explained here. The frame 8 corresponding to the attachment member 4 of drawing 1 holds the attachment component 9 to which it is high, and changes from the small resin material of a coefficient of expansion (PPS, strengthening polycarbonate material, etc.), and thermal resistance changes from a metal, and is fixed. Positioning section 8a of the shape of L character which projected in those four corners is prepared in the side front of this frame 8, and ramp 8b which engages with a wedge 5 is further prepared in the background.

[0024] Square window hole 9a has ended in the center section of the attachment component 9, the adhesives hardened by the light are applied around window hole 9a, liquid crystal panel 1b is stuck, and hardening immobilization is carried out by optical exposure. And the frame part of the periphery of window hole 9a is performing protection from light to a part for the non-light entrance to liquid crystal panel 1b. A flexible printed circuit board (FPC) 10 is fixed to liquid crystal panel 1b possible [ a flow ] with the anisotropy electric conduction film (ACF) 11, and it is pulled out outside from the crevice of a frame 8. Moreover, resilient part 9b which projected in the shape of T character, could extend, and was formed from each side of the square frame of the body is prepared in the attachment component 9, and temporary immobilization of the resilient part 9b is carried out at positioning section 8a of a frame 8 using elastic force. And actual immobilization of the attachment component 9 is carried out at a frame 8

by the adhesives which are light hardening molds and moreover soften a part for a corner with a square body with heating, and a liquid crystal panel unit is formed. The liquid crystal panel unit corresponding to those liquid crystal panels is formed by attaching similarly liquid crystal panels 1a and 1c in the photosynthesis prism 6. An assembly and alignment tuning are performed like the case of drawing 1, and a prism unit is formed.

[0025] In addition, since exchange of the defective of liquid crystal panel 1a, 1b, and 1c produced after formation of drawing 5 and the prism unit of drawing 6 heats a part for jointing of an attachment component 9 and a frame 8 like the case of drawing 1 and softens adhesives, it exfoliates an attachment component 9. And assembly direct is carried out to the liquid crystal panel unit of an excellent article, and the same assembly and tuning as the above-mentioned are performed, and adhesion immobilization can be carried out similarly and it can be made to reproduce again. Under the present circumstances, focal tuning can be excluded if the precision of the liquid crystal side location of a liquid crystal panel unit is taken out in the allowed value. However, even if it does not use the alignment adjustment machine of dedication, if it can be made to perform alignment tuning by the help, workability will improve much more.

[0026] Drawing 7 (A) and (B) are the fragmentary sectional views of drawing 5 and the operation gestalt of drawing 6. In drawing 7 (A), partial bending section 9c (plurality) is prepared in the body periphery section of an attachment component 9, the adhesives of liquid crystal panel 1b flow, and it uses for the stop. It is effective for heightening the fixing force over liquid crystal panel 1b to prepare this bending section 9c; when the fluidity of adhesives is high.

[0027] In drawing 7 (B), the slant surface part of the head of a flat countersunk head screw 12 is made to engage with the body periphery section of an attachment component 9, and rotation adjustment within the flat surface which includes X, the direction of a Y-axis, and XY shaft by the thread-fastening upper and lower sides is carried out. Adhesives are applied to the screw-thread part of a flat countersunk head screw 12; these adhesives are stuck and hardened to a partner's member with the pressure of thread fastening, and the thing of an aversion hardening mold is used. Moreover, the resin film can be made to be able to form in a screw side, it can loosen, and a torque rise can also be aimed at. In addition, a flat countersunk head screw 12 is only attached and adjusted to the side from which the location of liquid crystal panel 1b has shifted, and can also support an opposite direction according to the spring force of resilient part 9b.

[0028] Drawing 7 (C) and drawing 7 (D) are the fragmentary sectional views showing the application of drawing 7 (B). The example of drawing 7 (C) is an example using the eccentric cam 13 attached in the dowel so that it might have friction torque instead of the flat countersunk head screw of drawing 7 (B). Instead of an eccentric cam 13, the example of drawing 7 (D) is an example to which fitting of the eccentric pin 14 was carried out to the hole. An eccentric cam 13 or the eccentric pin 14 is all stopped also for that of these by the friction stop.

[0029] Drawing 8 is the top view showing the frame 8 of the operation gestalt of drawing 6, and other examples of a configuration of an attachment component 9. 9d (four places) of joining segments is formed between the body part of an attachment component 9, and resilient part 9b, fitting of the dowel 8b (2) prepared in the frame 8 is carried out to hole 9e. 9f prepared in 9d of the joining segment, and the attachment component 9 is fixed to a frame 8 according to an assembly and \*\*\*\* 15 (4). It serves also as preventing deformation of the curvature of the body section by the reaction force of resilient part 9b, a twist, etc. with a screw thread 15.

[0030] When exchange of a liquid crystal panel is needed, \*\*\*\* 15 is removed and a defect's liquid crystal panel unit is removed. And after cutting dowel 8b, resilient part 9b is hooked on positioning section 8a, and temporary immobilization of the attachment component 9 which the liquid crystal panel of an excellent article pasted up is carried out. After carrying out alignment adjustment using the controller material 12, 13, and 14 shown in above-mentioned drawing 7 (B) - (D), actual immobilization is carried out with said screw thread 15.

[0031] Moreover, liquid crystal panel 1b is explained to an attachment component 9 based on drawing 9 about the structure which carries out adhesion immobilization. drawing 9 is the front view of an attachment component 9, lowers the spindle (abbreviation among drawing) which set the attachment component 9 to the fixture (abbreviation among drawing), carried out location appearance of the liquid crystal panel 1b, carried out it, and carried out chucking under vacuum, and installs it on an attachment component 9. In this condition, adhesives with the comparatively high fixed force are bent with a light hardening mold with the periphery section of liquid crystal panel 1b of 12:00 of a clock, and a 4:00 and the 8:00 direction, and it applies to punctiform 16a between section 9c. And make the light irradiate, and it is made to harden and fixes. Furthermore, other partial 16b carries out reinforcement adhesion of elasticity like silicon resin with the adhesives of the existing light hardening mold. In addition, other aforementioned partial 16b is omissible if the reinforcement of fixing of the aforementioned punctiform 16a is enough. Moreover, if the lack section of bending section 9c is complemented with another member, the reinforcement effectiveness is acquired much more by it, and you can make it stabilized.

[0032] Drawing 10 is the top view showing the frame 8 of the operation gestalt of drawing 6, and other examples of a configuration of an attachment component 9, and drawing 11 is the top view having shown the detail of the attachment component 9. In this operation gestalt, the resilient part for carrying out temporary immobilization of a frame 8 and the attachment component 9 is prepared in the frame 8 instead of an attachment component 9. Resilient part 8c to which it projected from the neighborhood of the body of a frame 8, and elasticity was given gives and carries out temporary immobilization of the elasticity in contact with a part for the corner of the body of an attachment component 9. And 9d of projection pieces of an attachment component 9 is \*\*\*\*\*ed, and actual immobilization is carried out by 15. In addition, only the central part which connected resilient part 8c of a pair is connected with the body of a frame 8, and the other part will be floated to the body of a frame 8. In addition, the example justified in three points by the spacer 5 in this operation gestalt is shown.

[0033] Drawing 12 is the sectional view showing the configuration of a part of liquid crystal panel unit concerning other operation gestalten of this invention. In this operation gestalt, adhesion immobilization of the liquid crystal panel 1b is carried out like [ the shielding cases 17a and 17b which consist of conductive members, such as a metal, ] the case of the operation gestalt of drawing 9. The square window hole is established in the central part of shielding cases 17a and 17b, and window hole 17c prepared in shielding case 17b carries out the same work as window hole 9a prepared in the attachment component 9. Alignment tuning is performed like the operation gestalt of drawing 1, and forms a prism unit. In addition, if shielding case 17b shown in drawing 12 is placed and replaced with the attachment component 9 shown in drawing 6, it will become possible to employ both advantages efficiently.

[0034] Drawing 13 is the sectional view showing the modification of drawing 12. This operation gestalt is an example at the time of omitting outside shielding case 17b among the shielding cases 17a and 17b of the pair of drawing 12.

[0035] In drawing 12 and the operation gestalt of drawing 13, since there is no obstruction by forming the passage of the vertical direction (direction which intersects perpendicularly with space), and sending a cooling wind from a lower part with the optical plane of incidence, the attachment member 4, and polarizing plate 3 of the photosynthesis prism 6, the plane of incidence and the polarizing plate 3 of photosynthesis prism can be cooled effectively.

[0036] Drawing 14 is the top view showing the configuration of a part of optical unit concerning other operation gestalten of this invention. The photosynthesis prism 6 is positioned and fixed to a housing 18 in this operation gestalt. Adhesion immobilization of liquid crystal panel 1a, 1b, and the 1c is carried out into the crevice (three places) established in the housing 18 with the adhesives which are light hardening molds and are softened with heating through a spacing member 5. Of course, alignment tuning is the same as that of drawing 1. In addition, a housing 18 fixes a projector lens 7 with screws and forms the optical unit.

[0037] Drawing 15 is the top view of the optical unit concerning the application of drawing 14. In this



operation gestalt, every two dowel 18a is prepared in the crevice to the housing 18 of the operation gestalt of drawing 14 . The liquid crystal panel unit uses the thing in the condition of having deleted elastic section 9b of the attachment component 9 of drawing 5 . By making it engaged so that hole 9e.9f prepared in the attachment component 9 may have backlash in dowel 18a, the same ally noodle tuning as the operation gestalt of drawing 1 is made possible. It is made to fix after adjustment with the adhesives softened with heating in a light hardening mold. According to the structure of such drawing 14 and drawing 15 , the photosynthesis prism 6 can also be transposed to a dichroic mirror.

[0038] Drawing 16 is the sectional view of the operation gestalt which transposed the photosynthesis prism 6 of drawing 14 to the dichroic mirror 20. Moreover, it also becomes possible to unite with the box of the optical system which supports the mirror from which a housing 18 separates a lamp light into red, green, and blue, and the mirrors which carry out a reflective light guide. Furthermore, in a housing 18, drawing 1 , drawing 5 , drawing 8 , and the prism unit of drawing 12 can be made to be able to contain, and an optical unit can also be formed.

[0039] Drawing 17 (A) - (C) is the top view showing the configuration of a part of optical unit concerning the operation gestalt of further others of this invention. In the operation gestalt of drawing 17 (A), the outgoing radiation side polarizing plate 3 is stuck on the optical plane of incidence of the photosynthesis prism 6, and liquid crystal panel 1b is arranged to the latest of a polarizing plate 3. And after it performed alignment tuning like the operation gestalt of drawing 1 and location \*\*\*\* has finished, adhesion immobilization is carried out by the spacing member 5.

[0040] In the operation gestalt of drawing 17 (B), heights 3a which had an inclined plane in the outgoing radiation side polarizing plate 3 was formed, and the adhesive strength which was made to engage with the inclined plane of this heights 3a and the slant face of a spacing member 5, and was stabilized is secured.

[0041] The transparent sheet member 19 is stuck on the optical plane of incidence of the photosynthesis prism 6 in the operation gestalt of drawing 17 (C). Moreover, the outgoing radiation side polarizing plate 3 is stuck on liquid crystal panel 1b. A spacing member 5 is arranged between the transparence sheet member 19 and the outgoing radiation side polarizing plate 3, and adhesion immobilization is carried out between. Exchange of the liquid crystal panel 1 which became a defect removes the outgoing radiation side polarizing plate 3 in drawing 17 (A) and the operation gestalt of (B), removes the transparence sheet member 19 in the operation gestalt of drawing 17 (C), and it is restuck again and it reproduces it, of course, a spacing member 5 is removed. — this — \*\* — it can be alike and a liquid crystal panel 1 can also be exchanged more.

[0042] In addition, in an above-mentioned operation gestalt, although omitted in drawing, the fan for cooling is stationed to the direction down side of a cross section of the photosynthesis prism 6. A cooling wind is pressured upwards with this cooling fan, and generation of heat is made to absorb from the field of the plane of incidence of a liquid crystal panel, an outgoing radiation side polarizing plate, and an incidence side polarizing plate. (abbreviation among drawing). In this invention, since the device which carries out focal adjustment with alignment adjustment is omissible, the passage for a tooth space where the adjustment device became unnecessary can be extended. Furthermore, \*\* which makes passage form in the vertical direction by the attachment member 4, the frame 8, and housing 18 grade is made.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the top view showing the configuration of the optical unit of the liquid crystal projector concerning 1 operation gestalt of this invention.

[Drawing 2] It is the block diagram showing the configuration of the control device for performing the assembly activity and alignment tuning of the optical unit of drawing 1.

[Drawing 3] (A) And (B) is the explanatory view of the image displayed on CRT, when performing alignment tuning.

[Drawing 4] (A) – (C) is the part plan showing other examples of a configuration of the attachment member of drawing 1.

[Drawing 5] It is the top view showing the configuration of a part of optical unit of the liquid crystal projector concerning other operation gestalten of this invention:

[Drawing 6] It is the front view to which the optical unit of drawing 5 was expanded.

[Drawing 7] (A) And (B) is a sectional view in which the fragmentary sectional view of drawing 5 and the operation gestalt of drawing 6, (C), and (D) show the application of the operation gestalt of drawing 7 (B).

[Drawing 8] It is the front view showing the frame of the operation gestalt of drawing 6, and other examples of a configuration of an attachment component.

[Drawing 9] It is the front view showing the detail of the attachment component of drawing 8:

[Drawing 10] It is the front view showing the frame of the operation gestalt of drawing 6, and the example of a configuration of further others of an attachment component.

[Drawing 11] It is the front view showing the detail of the attachment component of drawing 10.

[Drawing 12] It is the top view showing the configuration of a part of optical unit of the liquid crystal projector concerning other operation gestalten of this invention.

[Drawing 13] It is the top view showing the application of the operation gestalt of drawing 12.

[Drawing 14] It is the top view showing the configuration of a part of optical unit of the liquid crystal projector which starts other operation gestalten of this invention, respectively.

[Drawing 15] It is the top view showing the configuration of a part of optical unit of the liquid crystal projector which starts other operation gestalten of this invention, respectively.

[Drawing 16] It is the top view showing the configuration of a part of optical unit of the liquid crystal projector which starts other operation gestalten of this invention, respectively.

[Drawing 17] (A) – (C) is the top view showing the configuration of a part of optical unit of the liquid crystal projector which starts other operation gestalten of this invention, respectively.

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[Translation done.]